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a processing unit which can perform a configuration procedure to generate said initial data capacities to configure said system to operate at the data rate R; and said processing unit being further configured to perform a first adaptation procedure to generate said adapted data capacities within a first time period when significant changes are required in the data rate R; and said processing unit being otherwise configured to perform a second adaptation procedure to generate said adapted, data capacities within a second time period, said second time period being shorter than said first time period; wherein the processing unit executes the configuration procedure until said data rate is achieved or until a specified iteration criteria parameter is satisfied and thereafter executes either or both of the first and second adaptation routines as needed to maintain the data rate R.

2. The circuit of claim 1, wherein the processing unit selects which of the adaptation routines to execute based on an evaluation of one or more of the following parameters: (a) signal-to-noise ratios for the K sub-channels; (b) variations in said transmission characteristics; (c) variations in said rate R; (d) a specified allowable system adaptation time period.

3. The circuit of claim 2, wherein said first adaptation routine is selected by said processing unit when variations in said signal-to noise ratios are relatively large.

4. The circuit of claim 3, wherein said second adaptation routine is selected by said processing unit when the signal-to-noise ratios and data rate R variations are relatively small.

5. The circuit of claim 3, wherein said second adaptation routine is selected by said processing unit when a specified allowable system adaptation time period is relatively small.

6. A method of controlling a data transmission through a channel having varying transmission characteristics, the method comprising the steps of:

- (a) initializing sub-channel data carriers to be used for the data transmission with initial capacity parameters, which initial capacity parameters are based on initial signal to noise ratios measured for said sub-channel data carriers;
- (b) monitoring the channel, including the varying transmission characteristics, to determine if changes are required in said initial capacity parameters;
- (c) using a first adaptation routine to modify said initial capacity parameters when said changes are relatively large, said first adaptation routine requiring a first time period to complete and including a new measurement of said signal to noise ratios;
- (d) using a second adaptation routine to modify said initial capacity parameters when said changes are not relatively large, said second adaptation routine requiring a second time period to complete, which second time period is shorter than said first time period, and does not include a new measurement of said signal to noise ratios.

7. The method of claim 6, wherein said varying transmission characteristics include line disturbances that affect the signal to noise ratios and/or power margins of said sub-channel data carriers.

8. The method of claim 6, wherein said initialization routine is also used for said first adaptation routine.

9. The method of claim 6, further including a step (b) monitoring the channel for requests for modifications to a

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data rate, and based on such request selecting either said first adaptation routine or said second adaptation routine.

10. The circuit of claim 6, wherein said second adaptation routine is selected by said processing unit when a specified allowable system adaptation time period is relatively small.

11. A method of controlling a data transmission through a channel having varying transmission characteristics, the method comprising the steps of:

- (a) configuring sub-channel data carriers to be used for the data transmission with initial capacity parameters using an initialization routine;
- (b) monitoring the channel, including the varying transmission characteristics, to determine if changes are required in said initial capacity parameters;
- (c) based on step (b), selecting either of a first adaptation routine or a second adaptation routine to load said sub-channel data carriers as needed with modified capacity parameters such that:
 - said first adaptation routine loads said sub-channel data carriers with said modified capacity parameters using re-computed signal to noise ratios for said sub-channel data carriers;
 - said second adaptation routine loads said sub-channel data carriers with said modified capacity parameters using previously computed signal to noise ratios for said sub-channel data carriers.

12. The method of claim 11 wherein said previously computed signal to noise ratios are based on said initial capacity parameters.

13. The method of claim 11, wherein said varying transmission characteristics include line disturbances that affect the signal to noise ratios and/or power margins of said sub-channel data carriers.

14. The method of claim 11, wherein said initialization routine is also used for said first adaptation routine.

15. The method of claim 11, further including a step (b)': monitoring the channel for requests for modifications to a data rate, and based on such request selecting either said first adaptation routine or said second adaptation routine.

16. A method of controlling bit and gain loadings for sub-carriers used in a data transmission through a channel having a target data rate R and a nominal power transmission P, the method comprising the steps of:

- (a) initializing the sub-channel data carriers with initial capacity parameters to achieve the target data rate R and nominal power transmission P, which initial capacity parameters are based on initial signal to noise ratios measured for the sub-channel data carriers;
- (b) identifying whether any data rate changes and/or power transmission changes are requested and/or required to the target data rate R and nominal power transmission respectively,
- (c) in response to any such data rate changes and/or power transmission changes identified, modifying said initial capacity parameters to generate modified capacity parameters for achieving said data rate changes and power transmission changes, such that:

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a first adaptation routine is used for generating said modified capacity parameters when said data rate changes and/or said power transmission charges are significant; and

otherwise a second adaptation routine is used for generating said modified capacity parameters. 5

17. The method of claim 16, wherein said previously computed signal to noise ratios are based on said initial capacity parameters.

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18. The method of claim 16, wherein line disturbances that affect the signal to noise ratios and/or power margins of said sub-channel data carriers are also identified in step (b).

19. The method of claim 16, wherein during step (a) an initialization routine is used, which initialization routine is repeated during step (c) for said first adaptation routine.

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